maine DEPARTMENT OF Agriculture Conservation & Forestry

# *ESCHERICHIA COLI* O157:H7

Funding for this publication was made possible in part by the Food & Drug Administration grant PAR-16-137.
The views expressed do not necessarily reflect the official policies of the Department of Health & Human Services.

## BIOLOGY

**Organism:** There are more than 700 strains of *Escherichia coli* (*E. coli*), most of which are harmless. *E. coli* O157:H7 is a non-spore-forming bacteria that moves by using flagella, and is the strain of *E. coli* most commonly associated with foodborne illness.
**Conditions for Survival:** *E. coli* O157:H7 *t*olerates temperatures from 45° - 121°F and thrives in warm, damp, and dark environments. It can function at normal to nearly no oxygen levels.
**Important Reservoirs:** Pathogenic *E. coli* O157:H7 is commonly found in the guts and feces of animals and especially ruminants (cattle, deer, goats, sheep) Humans are also common carriers. It can persist in dust, soil, sediment, and water for weeks and months.

## ILLNESS

**Onset:** Illness begins 3-4 days after consumption; can be up to 9 days after ingestion.
**Symptoms:** Abdominal pain, diarrhea (often bloody), vomiting and fever.
**Duration:** ~8 days in typical cases.
**Complications:** Diarrhea and vomiting can lead to severe and sometimes fatal dehydration. Diarrhea may be extreme and may become grossly bloody, occurring every 15-30 minutes. Hemmorhagic colitis can lead to hemolytic uremic syndrome (HUS), whose symptoms include anemia, low platelet counts, and acute kidney failure.
**Special Risks:** Children, the elderly, and the immunocompromised are all at a high risk to serious infection. *E. coli*-induced diarrhea causes a significant portion of infant mortality in the developing world.
**Hospitalizations:** ~46% in produce-related *E. coli* O157:H7 outbreaks.
**Mortality Rate:** ~10% of patient develop HUS; mortality rate for patients with HUS is ~3-5%. Mortality rates can be as high as 50% for elderly patients who develop HUS.

## FOODS

**Common foods associated with outbreaks:**
Ground beef, raw milk, soft cheese, water, apple cider, un-pasteurized apple juice.
**Pathogenic *E. coli* is the second leading cause of fresh produce-related illness outbreaks. Frequently associated with lettuce, leafy greens, and sprouts.**

**~63,000**
CASES / YEAR
(FROM *E. COLI* O157:H7 ALONE)

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## PRODUCE FARMS

**Areas of Concern:** Generic *E. coli* is used as an indicator of fecal contamination in water testing because it is so common in the feces of warm-blooded animals. Pathogenic *E. coli* O157:H7 is especially common in ruminants (cattle, goats, sheep, deer). Because of this we are especially concerned about **cattle movements, adjacent land use, manure storage, protection of water sources, heavy deer traffic,** and **worker hygiene.**

*E. coli* contamination is a concern in both surface and ground water. Ground water is influenced by surface water movements and leaching down to 30 ft deep or more.

## CASE STUDY

**2018 *E. coli* O157:H7 Outbreak in Romaine Lettuce:** 36 states, 210 cases, 96 hospitalizations, 27 cases of HUS and 5 deaths. Median age 28 years old.

**Traceback:** In early April of 2018, a multi-state outbreak of *E. coli* O157:H7 triggered a traceback investigation of Romaine lettuce administered by the FDA. The contaminated Romaine lettuce was traced back to the Yuma growing region straddling Arizona and California. 36 fields on 23 different farms were identified as being the suppliers of the contaminated Romaine.

**Findings:** A 3.5 mile stretch of irrigation canal used by many of the area's farmers was tested and found to be positive for *E. coli* O157:H7. Some large animal feed operations adjacent to the canal were the likely source of contamination. Water from the canal had been used by many area growers to dilute pesticides prior to application. A late frost led to some injury on the lettuce, making it more susceptible to contamination.

## CONTROLS

- Separate animals and their manures from produce and water sources.
- Know your water quality before applying it to produce or food contact surfaces.
- Consider adjacent land use that may drain into your fields or your water sources.
- Don't harvest produce that may have been contaminated by animals.
- Emphasize hand-washing, clean clothes, and sanitation of food contact surfaces.

## LINKS

**FDA outbreak investigation report:** http://bit.ly/39pAuOr
**In-depth review of pathogenic *E. coli* in fresh vegetables:** http://bit.ly/3oCs2Sd
**FDA Bad Bug Book profiling pathogens:** https://bit.ly/2XuhEAi